

1/23

SEQUENCE LISTING

<110> Sung Dr., Wing

<120> Xylanases with Enhanced Thermophilicity and Alkalophilicity

<130> 08-893220US

<140>

<141>

<160> (53) 7

<170> PatentIn Ver. 2.1

<210> 1

<211> 184

<212> PRT

<213> Aspergillus niger

<400> 1

Ser	Ala	Gly	Ile	Asn	Tyr	Val	Gln	Asn	Tyr	Asn	Gly	Asn	Leu	Gly	Asp
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Phe	Thr	Tyr	Asp	Glu	Ser	Ala	Gly	Thr	Phe	Ser	Met	Tyr	Trp	Glu	Asp
			20					25					30		

Gly	Val	Ser	Ser	Asp	Phe	Val	Val	Gly	Leu	Gly	Trp	Thr	Thr	Gly	Ser
		35					40					45			

Ser	Asn	Ala	Ile	Thr	Tyr	Ser	Ala	Glu	Tyr	Ser	Ala	Ser	Gly	Ser	Ser
	50					55					60				

Ser	Tyr	Leu	Ala	Val	Tyr	Gly	Trp	Val	Asn	Tyr	Pro	Gly	Ala	Glu	Tyr
	65				70					75				80	

Tyr	Ile	Val	Glu	Asp	Tyr	Gly	Asp	Tyr	Asn	Pro	Cys	Ser	Ser	Ala	Thr
				85					90					95	

Ser	Leu	Gly	Thr	Val	Tyr	Ser	Asp	Gly	Ser	Thr	Tyr	Gln	Val	Cys	Thr
			100					105					110		

Asp	Thr	Arg	Ile	Asn	Glu	Pro	Ser	Ile	Thr	Gly	Thr	Ser	Thr	Phe	Thr
		115					120					125			

Gln	Tyr	Phe	Ser	Val	Arg	Glu	Ser	Thr	Arg	Thr	Ser	Gly	Thr	Val	Thr
	130					135					140				

Val	Ala	Asn	His	Phe	Asn	Phe	Trp	Ala	Gln	His	Gly	Phe	Gly	Asn	Ser
	145				150					155				160	

Asp	Phe	Asn	Tyr	Gln	Val	Met	Ala	Val	Glu	Ala	Trp	Ser	Gly	Ala	Gly
				165					170					175	

Ser	Ala	Ser	Val	Thr	Ile	Ser	Ser
							180

1

TOTAL: 42306660

2 /23

<210> 2
 <211> 185
 <212> PRT
 <213> *Aspergillus tubingensis*

<400> 2
 Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gln Asn Leu Gly Asp
 1 5 10 15
 Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
 20 25 30
 Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Gly Trp Thr Thr Gly
 35 40 45
 Ser Ser Asn Ala Ile Thr Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser
 50 55 60
 Ala Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gln Ala Glu
 65 70 75 80
 Tyr Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala
 85 90 95
 Thr Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys
 100 105 110
 Thr Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe
 115 120 125
 Thr Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val
 130 135 140
 Thr Val Ala Asn His Phe Asn Phe Trp Ala His His Gly Phe His Asn
 145 150 155 160
 Ser Asp Phe Asn Tyr Gln Val Val Ala Val Glu Ala Trp Ser Gly Ala
 165 170 175
 Gly Ser Ala Ala Val Thr Ile Ser Ser
 180 185

<210> 3
 <211> 185
 <212> PRT
 <213> *Bacillus circulans*

<400> 3
 Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
 1 5 10 15
 Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
 20 25 30
 Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
 35 40 45

2

TOTAL 4280660

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Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
50 55 60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
65 70 75 80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
85 90 95

Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
100 105 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
115 120 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
130 135 140

Thr Phe Thr Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
145 150 155 160

Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
165 170 175

Ser Gly Ser Ser Asn Val Thr Val Trp
180 185

<210> 4
<211> 201
<212> PRT
<213> Bacillus pumilus

<400> 4
Arg Thr Ile Thr Asn Asn Glu Met Gly Asn His Ser Gly Tyr Asp Tyr
1 5 10 15

Glu Leu Trp Lys Asp Tyr Gly Asn Thr Ser Met Thr Leu Asn Asn Gly
20 25 30

Gly Ala Phe Ser Ala Gly Trp Asn Asn Ile Gly Asn Ala Leu Phe Arg
35 40 45

Lys Gly Lys Lys Phe Asp Ser Thr Arg Thr His His Gln Leu Gly Asn
50 55 60

Ile Ser Ile Asn Tyr Asn Ala Ser Phe Asn Pro Ser Gly Asn Ser Tyr
65 70 75 80

Leu Cys Val Tyr Gly Trp Thr Gln Ser Pro Leu Ala Glu Tyr Tyr Ile
85 90 95

Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Ala Tyr Lys Gly Ser
100 105 110

Phe Tyr Ala Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Thr Arg Val
115 120 125

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Asn Gln Pro Ser Ile Ile Gly Ile Ala Thr Phe Lys Gln Tyr Trp Ser
 130 135 140
 Val Arg Gln Thr Lys Arg Thr Ser Gly Thr Val Ser Val Ser Ala His
 145 150 155 160
 Phe Arg Lys Trp Glu Ser Leu Gly Met Pro Met Gly Lys Met Tyr Glu
 165 170 175
 Thr Ala Phe Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala Asn Val
 180 185 190
 Met Thr Asn Gln Leu Phe Ile Gly Asn
 195 200

<210> 5
 <211> 185
 <212> PRT
 <213> Bacillus subtilis

<400> 5
 Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
 1 5 10 15
 Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
 20 25 30
 Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
 35 40 45
 Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
 50 55 60
 Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
 65 70 75 80
 Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
 85 90 95
 Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
 100 105 110
 Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
 115 120 125
 Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
 130 135 140
 Thr Phe Ser Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
 145 150 155 160
 Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
 165 170 175
 Ser Gly Ser Ser Asn Val Thr Val Trp
 180 185

5/23

<210> 6
 <211> 211
 <212> PRT
 <213> Clostridium acetobutylicum

<400> 6
 Ser Ala Phe Asn Thr Gln Ala Ala Pro Lys Thr Ile Thr Ser Asn Glu
 1 5 10 15
 Ile Gly Val Asn Gly Gly Tyr Asp Tyr Glu Leu Trp Lys Asp Tyr Gly
 20 25 30
 Asn Thr Ser Met Thr Leu Lys Asn Gly Gly Ala Phe Ser Cys Gln Trp
 35 40 45
 Ser Asn Ile Gly Asn Ala Leu Phe Arg Lys Gly Lys Lys Phe Asn Asp
 50 55 60
 Thr Gln Thr Tyr Lys Gln Leu Gly Asn Ile Ser Val Asn Tyr Asn Cys
 65 70 75 80
 Asn Tyr Gln Pro Tyr Gly Asn Ser Tyr Leu Cys Val Tyr Gly Trp Thr
 85 90 95
 Ser Ser Pro Leu Val Glu Tyr Tyr Ile Val Asp Ser Trp Gly Ser Trp
 100 105 110
 Arg Pro Pro Gly Gly Thr Ser Lys Gly Thr Ile Thr Val Asp Gly Gly
 115 120 125
 Ile Tyr Asp Ile Tyr Glu Thr Thr Arg Ile Asn Gln Pro Ser Ile Gln
 130 135 140
 Gly Asn Thr Thr Phe Lys Gln Tyr Trp Ser Val Arg Arg Thr Lys Arg
 145 150 155 160
 Thr Ser Gly Thr Ile Ser Val Ser Lys His Phe Ala Ala Trp Glu Ser
 165 170 175
 Lys Gly Met Pro Leu Gly Lys Met His Glu Thr Ala Phe Asn Ile Glu
 180 185 190
 Gly Tyr Gln Ser Ser Gly Lys Ala Asp Val Asn Ser Met Ser Ile Asn
 195 200 205
 Ile Gly Lys
 210

<210> 7
 <211> 206
 <212> PRT
 <213> Clostridium stercorarium

<400> 7
 Gly Arg Ile Ile Tyr Asp Asn Glu Thr Gly Thr His Gly Gly Tyr Asp
 1 5 10 15

5

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6/23

Tyr Glu Leu Trp Lys Asp Tyr Gly Asn Thr Ile Met Glu Leu Asn Asp
 20 25 30
 Gly Gly Thr Phe Ser Cys Gln Trp Ser Asn Ile Gly Asn Ala Leu Phe
 35 40 45
 Arg Lys Gly Arg Lys Phe Asn Ser Asp Lys Thr Tyr Gln Glu Leu Gly
 50 55 60
 Asp Ile Val Val Glu Tyr Gly Cys Asp Tyr Asn Pro Asn Gly Asn Ser
 65 70 75 80
 Tyr Leu Cys Val Tyr Gly Trp Thr Arg Asn Phe Leu Val Glu Tyr Tyr
 85 90 95
 Ile Val Glu Ser Trp Gly Ser Trp Arg Pro Pro Gly Ala Thr Pro Lys
 100 105 110
 Gly Thr Ile Thr Gln Trp Met Ala Gly Thr Tyr Glu Ile Tyr Glu Thr
 115 120 125
 Thr Arg Val Asn Gln Pro Ser Ile Asp Gly Thr Ala Thr Phe Gln Gln
 130 135 140
 Tyr Trp Ser Val Arg Thr Ser Lys Arg Thr Ser Gly Thr Ile Ser Val
 145 150 155 160
 Thr Glu His Phe Lys Gln Trp Glu Arg Met Gly Met Arg Met Gly Lys
 165 170 175
 Met Tyr Glu Val Ala Leu Thr Val Glu Gly Tyr Gln Ser Ser Gly Tyr
 180 185 190
 Ala Asn Val Tyr Lys Asn Glu Ile Arg Ile Gly Ala Asn Pro
 195 200 205

<210> 8
 <211> 211
 <212> PRT
 <213> Ruminococcus flavefaciens

<400> 8
 Ser Ala Ala Asp Gln Gln Thr Arg Gly Asn Val Gly Gly Tyr Asp Tyr
 1 5 10 15
 Glu Met Trp Asn Gln Asn Gly Gln Gly Gln Ala Ser Met Asn Pro Gly
 20 25 30
 Ala Gly Ser Phe Thr Cys Ser Trp Ser Asn Ile Glu Asn Phe Leu Ala
 35 40 45
 Arg Met Gly Lys Asn Tyr Asp Ser Gln Lys Lys Asn Tyr Lys Ala Phe
 50 55 60
 Gly Asn Ile Val Leu Thr Tyr Asp Val Glu Tyr Thr Pro Arg Gly Asn
 65 70 75 80

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Ser Tyr Met Cys Val Tyr Gly Trp Thr Arg Asn Pro Leu Met Glu Tyr
 85 90 95
 Tyr Ile Val Glu Gly Trp Gly Asp Trp Arg Pro Pro Gly Asn Asp Gly
 100 105 110
 Glu Val Lys Gly Thr Val Ser Ala Asn Gly Asn Thr Tyr Asp Ile Arg
 115 120 125
 Lys Thr Met Arg Tyr Asn Gln Pro Ser Leu Asp Gly Thr Ala Thr Phe
 130 135 140
 Pro Gln Tyr Trp Ser Val Arg Gln Thr Ser Gly Ser Ala Asn Asn Gln
 145 150 155 160
 Thr Asn Tyr Met Lys Gly Thr Ile Asp Val Ser Lys His Phe Asp Ala
 165 170 175
 Trp Ser Ala Ala Gly Leu Asp Met Ser Gly Thr Leu Tyr Glu Val Ser
 180 185 190
 Leu Asn Ile Glu Gly Tyr Arg Ser Asn Gly Ser Ala Asn Val Lys Ser
 195 200 205
 Val Ser Val
 210
 <210> 9
 <211> 197
 <212> PRT
 <213> Schizophyllum commune
 <400> 9
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 1 5 10 15
 Trp Trp Thr Asp Gly Ala Gly Asp Ala Thr Tyr Gln Asn Asn Gly Gly
 20 25 30
 Gly Ser Tyr Thr Leu Thr Trp Ser Gly Asn Asn Gly Asn Leu Val Gly
 35 40 45
 Gly Lys Gly Trp Asn Pro Gly Ala Ala Ser Arg Ser Ile Ser Tyr Ser
 50 55 60
 Gly Thr Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp
 65 70 75 80
 Thr Arg Ser Ser Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Ser
 85 90 95
 Tyr Asp Pro Ser Ser Ala Ala Ser His Lys Gly Ser Val Thr Cys Asn
 100 105 110
 Gly Ala Thr Tyr Asp Ile Leu Ser Thr Trp Arg Tyr Asn Ala Pro Ser
 115 120 125

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Ile Asp Gly Thr Gln Thr Phe Glu Gln Phe Trp Ser Val Arg Asn Pro
 130 135 140
 Lys Lys Ala Pro Gly Gly Ser Ile Ser Gly Thr Val Asp Val Gln Cys
 145 150 155 160
 His Phe Asp Ala Trp Lys Gly Leu Gly Met Asn Leu Gly Ser Glu His
 165 170 175
 Asn Tyr Gln Ile Val Ala Thr Glu Gly Tyr Gln Ser Ser Gly Thr Ala
 180 185 190
 Thr Ile Thr Val Thr
 195

<210> 10

<211> 191

<212> PRT

<213> Streptomyces lividans

Xyl B

<400> 10

Asp Thr Val Val Thr Thr Asn Gln Glu Gly Thr Asn Asn Gly Tyr Tyr
 1 5 10 15
 Tyr Ser Phe Trp Thr Asp Ser Gln Gly Thr Val Ser Met Asn Met Gly
 20 25 30
 Ser Gly Gly Gln Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val
 35 40 45
 Ala Gly Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Gln Tyr Ser
 50 55 60
 Gly Ser Phe Asn Pro Ser Gly Asn Ala Tyr Leu Ala Leu Tyr Gly Trp
 65 70 75 80
 Thr Ser Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Thr
 85 90 95
 Tyr Arg Pro Thr Gly Glu Tyr Lys Gly Thr Val Thr Ser Asp Gly Gly
 100 105 110
 Thr Tyr Asp Ile Tyr Lys Thr Thr Arg Val Asn Lys Pro Ser Val Glu
 115 120 125
 Gly Thr Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg
 130 135 140
 Thr Gly Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
 145 150 155 160
 Ala Gly Met Pro Leu Gly Asn Phe Ser Tyr Tyr Met Ile Asn Ala Thr
 165 170 175
 Glu Gly Tyr Gln Ser Ser Gly Thr Ser Ser Ile Asn Val Gly Gly
 180 185 190

TOTAL 142806660

A

9/23

<210> 11
 <211> 191
 <212> PRT
 <213> Streptomyces lividans XylC

<400> 11
 Ala Thr Thr Ile Thr Thr Asn Gln Thr Gly Thr Asp Gly Met Tyr Tyr
 1 5 10 15
 Ser Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly
 20 25 30
 Gly Gly Ser Tyr Ser Thr Gln Trp Thr Asn Cys Gly Asn Phe Val Ala
 35 40 45
 Gly Lys Gly Trp Ser Thr Gly Asp Gly Asn Val Arg Tyr Asn Gly Tyr
 50 55 60
 Phe Asn Pro Val Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
 65 70 75 80
 Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
 85 90 95
 Pro Thr Gly Thr Tyr Lys Gly Thr Val Ser Ser Asp Gly Gly Thr Tyr
 100 105 110
 Asp Ile Tyr Gln Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Gly Thr
 115 120 125
 Lys Thr Phe Gln Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
 130 135 140
 Gly Ser Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
 145 150 155 160
 Ala Gly Met Asn Met Gly Gln Phe Arg Tyr Tyr Met Ile Asn Ala Thr
 165 170 175
 Glu Gly Tyr Gln Ser Ser Gly Ser Ser Asn Ile Thr Val Ser Gly
 180 185 190

<210> 12
 <211> 189
 <212> PRT
 <213> Streptomyces sp. NO. 36a

<400> 12
 Ala Thr Thr Ile Thr Asn Glu Thr Gly Tyr Asp Gly Met Tyr Tyr Ser
 1 5 10 15
 Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly Gly
 20 25 30
 Gly Ser Tyr Ser Thr Arg Trp Thr Asn Cys Gly Asn Phe Val Ala Gly
 35 40 45

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 TOTET-42806660

10/23

Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Arg Tyr Thr Gly Trp
 50 55 60
 Phe Asn Pro Ser Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
 65 70 75 80
 Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
 85 90 95
 Pro Thr Gly Glu Thr Arg Gly Thr Val His Ser Asp Gly Gly Thr Tyr
 100 105 110
 Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Ala Pro
 115 120 125
 Ala Ala Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
 130 135 140
 Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg Ala Gly
 145 150 155 160
 Met Asn Met Gly Asn Phe Arg Tyr Tyr Met Ile Asn Ala Thr Glu Gly
 165 170 175
 Tyr Gln Ser Ser Gly Ser Ser Thr Ile Thr Val Ser Gly
 180 185

<210> 13
 <211> 189
 <212> PRT
 <213> Thermomonospora fusca

<400> 13
 Ala Val Thr Ser Asn Glu Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser
 1 5 10 15
 Phe Trp Thr Asp Ala Pro Gly Thr Val Ser Met Glu Leu Gly Pro Gly
 20 25 30
 Gly Asn Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val Ala Gly
 35 40 45
 Lys Gly Trp Ala Thr Gly Gly Arg Arg Thr Val Thr Tyr Ser Ala Ser
 50 55 60
 Phe Asn Pro Ser Gly Asn Ala Tyr Leu Thr Leu Tyr Gly Trp Thr Arg
 65 70 75 80
 Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Ser Trp Gly Thr Tyr Arg
 85 90 95
 Pro Thr Gly Thr Tyr Met Gly Thr Val Thr Thr Asp Gly Gly Thr Tyr
 100 105 110
 Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Ile Glu Gly Thr
 115 120 125

10

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11/23

Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg Thr Ser
 130 135 140

Gly Thr Ile Thr Ala Gly Asn His Phe Asp Ala Trp Ala Arg His Gly
 145 150 155 160

Met His Leu Gly Thr His Asp Tyr Met Ile Met Ala Thr Glu Gly Tyr
 165 170 175

Gln Ser Ser Gly Ser Ser Asn Val Thr Leu Gly Thr Ser
 180 185

<210> 14
 <211> 190
 <212> PRT
 <213> Trichoderma harzianum

<400> 14
 Gln Thr Ile Gly Pro Gly Thr Gly Tyr Ser Asn Gly Tyr Tyr Tyr Ser
 1 5 10 15

Tyr Trp Asn Asp Gly His Ala Gly Val Thr Tyr Thr Asn Gly Gly Gly
 20 25 30

Gly Ser Phe Thr Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
 35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
 50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Ile Tyr Gly Trp Ser
 65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
 85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
 100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
 115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
 130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
 145 150 155 160

Ser His Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
 165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
 180 185 190

<210> 15

11

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<211> 178

<212> PRT

<213> Trichoderma reesei

Xyl II

<400> 15

Ala Ser Ile Asn Tyr Asp Gln Asn Tyr Gln Thr Gly Gly Gln Val Ser
 1 5 10 15

Tyr Ser Pro Ser Asn Thr Gly Phe Ser Val Asn Trp Asn Thr Gln Asp
 20 25 30

Asp Phe Val Val Gly Val Gly Trp Thr Thr Gly Ser Ser Ala Pro Ile
 35 40 45

Asn Phe Gly Gly Ser Phe Ser Val Asn Ser Gly Thr Gly Leu Leu Ser
 50 55 60

Val Tyr Gly Trp Ser Thr Asn Pro Leu Val Glu Tyr Tyr Ile Met Glu
 65 70 75 80

Asp Asn His Asn Tyr Pro Ala Gln Gly Thr Val Lys Gly Thr Val Thr
 85 90 95

Ser Asp Gly Ala Thr Tyr Thr Ile Trp Glu Asn Thr Arg Val Asn Glu
 100 105 110

Pro Ser Ile Gln Gly Thr Ala Thr Phe Asn Gln Tyr Ile Ser Val Arg
 115 120 125

Asn Ser Pro Arg Thr Ser Gly Thr Val Thr Val Gln Asn His Phe Asn
 130 135 140

Trp Ala Ser Leu Gly Leu His Leu Gly Gln Met Met Asn Tyr Gln Val
 145 150 155 160

Val Ala Val Glu Gly Trp Gly Gly Ser Gly Ser Ala Ser Gln Ser Val
 165 170 175

Ser Asn

<210> 16

<211> 190

<212> PRT

<213> Trichoderma reesei

Xyl II

<400> 16

Gln Thr Ile Gln Pro Gly Thr Gly Tyr Asn Asn Gly Tyr Phe Tyr Ser
 1 5 10 15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Tyr Thr Asn Gly Pro Gly
 20 25 30

Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
 35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly

12

TOTAL 4280660

13/23

50 55 60
 Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
 65 70 75 80
 Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
 85 90 95
 Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
 100 105 110
 Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
 115 120 125
 Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
 130 135 140
 Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
 145 150 155 160
 Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
 165 170 175
 Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
 180 185 190

 <210> 17
 <211> 190
 <212> PRT
 <213> Trichoderma viride

 <400> 17
 Gln Thr Ile Gln Pro Gly Thr Gly Phe Asn Asn Gly Tyr Phe Tyr Ser
 1 5 10 15
 Tyr Trp Asn Asp Gly His Gly Gly Val Thr Tyr Thr Asn Gly Pro Gly
 20 25 30
 Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
 35 40 45
 Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
 50 55 60
 Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
 65 70 75 80
 Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
 85 90 95
 Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
 100 105 110
 Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
 115 120 125
 Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Thr His

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130	135	140
Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala		
145	150	155 160
Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val		
	165	170 175
Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser		
	180	185 190

<210> 18

<211> 202

<212> PRT

<213> Fibrobacter succinogenes

<400> 18

Asn Ser Ser Val Thr Gly Asn Val Gly Ser Ser Pro Tyr His Tyr Glu		
1	5	10 15
Ile Trp Tyr Gln Gly Gly Asn Asn Ser Met Thr Phe Tyr Asp Asn Gly		
	20	25 30
Thr Tyr Lys Ala Ser Trp Asn Gly Thr Asn Asp Phe Leu Ala Arg Val		
	35	40 45
Gly Phe Lys Tyr Asp Glu Lys His Thr Tyr Glu Glu Leu Gly Pro Ile		
	50	55 60
Asp Ala Tyr Tyr Lys Trp Ser Lys Gln Gly Ser Ala Gly Gly Tyr Asn		
	65	70 75
Tyr Ile Gly Ile Tyr Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr		
	85	90 95
Ile Val Asp Asp Trp Phe Asn Lys Pro Gly Ala Asn Leu Leu Gly Gln		
	100	105 110
Arg Lys Gly Glu Phe Thr Val Asp Gly Asp Thr Tyr Glu Ile Trp Gln		
	115	120 125
Asn Thr Arg Val Gln Gln Pro Ser Ile Lys Gly Thr Gln Thr Phe Pro		
	130	135 140
Gln Tyr Phe Ser Val Arg Lys Ser Ala Arg Ser Cys Gly His Ile Asp		
	145	150 155
Ile Thr Ala His Met Lys Lys Trp Glu Glu Leu Gly Met Lys Met Gly		
	165	170 175
Lys Met Tyr Glu Ala Lys Val Leu Val Glu Ala Gly Gly Gly Ser Gly		
	180	185 190
Ser Phe Asp Val Thr Tyr Phe Lys Met Thr		
	195	200

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<210> 19

<211> 189

<212> PRT

<213> *Aspergillus awamorii* var. *Kawachi*

<400> 19

Arg Ser Thr Pro Ser Ser Thr Gly Glu Asn Asn Gly Tyr Tyr Tyr Ser
 1 5 10 15

Phe Trp Thr Asp Gly Gly Gly Asp Val Thr Tyr Thr Asn Gly Asn Ala
 20 25 30

Gly Ser Tyr Ser Val Glu Trp Ser Asn Val Gly Asn Phe Val Gly Gly
 35 40 45

Lys Gly Trp Asn Pro Gly Ser Ala Lys Asp Ile Thr Tyr Ser Gly Asn
 50 55 60

Phe Thr Pro Ser Gly Asn Gly Tyr Leu Ser Val Tyr Gly Trp Thr Thr
 65 70 75 80

Asp Pro Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Asp Tyr Asn
 85 90 95

Pro Gly Ser Gly Gly Thr Thr Arg Gly Asn Val Ser Ser Asp Gly Ser
 100 105 110

Val Tyr Asp Ile Tyr Thr Ala Thr Arg Thr Asn Ala Pro Ser Ile Asp
 115 120 125

Gly Thr Gln Thr Phe Ser Gln Tyr Trp Ser Val Arg Gln Asn Lys Arg
 130 135 140

Val Gly Gly Thr Val Thr Thr Ser Asn His Phe Asn Ala Trp Ala Lys
 145 150 155 160

Leu Gly Met Asn Leu Gly Thr His Asn Tyr Gln Ile Leu Ala Thr Glu
 165 170 175

Gly Tyr Gln Ser Ser Gly Ser Ser Ser Ile Thr Ile Gln
 180 185

<210> 20

<211> 194

<212> PRT

<213> *Thermomyces lanuginosus*

<400> 20

Gln Thr Thr Pro Asn Ser Glu Gly Trp His Asp Gly Tyr Tyr Tyr Ser
 1 5 10 15

Trp Trp Ser Asp Gly Gly Ala Gln Ala Thr Tyr Thr Asn Leu Glu Gly
 20 25 30

Gly Thr Tyr Glu Ile Ser Trp Gly Asp Gly Gly Asn Leu Val Gly Gly
 35 40 45

Lys Gly Trp Asn Pro Gly Leu Asn Ala Arg Ala Ile His Phe Glu Gly
 15

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50 55 60

Val Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Thr
65 70 75 80

Arg Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asp Pro Ser Ser Gly Ala Thr Asp Leu Gly Thr Val Glu Cys Asp Gly
100 105 110

Ser Ile Tyr Arg Leu Gly Lys Thr Thr Arg Val Asn Ala Pro Ser Ile
115 120 125

Asp Gly Thr Gln Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Asp Lys
130 135 140

Arg Thr Ser Gly Thr Val Gln Thr Gly Cys His Phe Asp Ala Trp Ala
145 150 155 160

Arg Ala Gly Leu Asn Val Asn Gly Asp His Tyr Tyr Gln Ile Val Ala
165 170 175

Thr Glu Gly Tyr Phe Ser Ser Gly Tyr Ala Arg Ile Thr Val Ala Asp
180 185 190

Val Gly

<210> 21
<211> 76
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TrX-1

<400> 21
ctagcraagg aggcctgcaga tgcaaacat acaaccagga accggttaca acaacgggta 60
crtttacagc tattgg 76

<210> 22
<211> 78
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTV-2

<400> 22
aacgatggcc atgggtggigt taccrataca aacggggcccg gagggccaatt tagcgtcaat 60
tgggtctaact ccggaaac 78

<210> 23
<211> 78

17/23

<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TrX-3

<400> 23
ttcgtaggctg gaaaagggtg gcaaccggg accaaaaata aggtgatcaa cttctctgga 60
tcctataatc cgaatggg 78

<210> 24
<211> 74
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-4

<400> 24
aattcatact taagcgctta tggctgggtc agaaaccac tgattgaata ttacattgtc 60
gaaaattctg gtac 74

<210> 25
<211> 51
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TrX-8

<400> 25
gattccctccg acgtctacgt ttgttatgtt ggcccttggc caatgttgtt g 51

<210> 26
<211> 84
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-7

<400> 26
ccaatgaaaa tgcgataac cttgctaccg gtaccaccac aatggatag ttgcccggg 60
ccrccgggta aatcgagtt aacc 84

<210> 27
<211> 78
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TrX-6

<400> 27

17

099084-110

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agattgagge ctttgaagca tccacctttt ccaaccgtcg ggccctgggtt tttattccac 60
tagttgaaga gacctaga 78

<210> 28
<211> 85
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-5

<400> 28
arattagget tacccttaag tatgaattcg cagataccga ccagatcttt gggtagactaa 60
cttataatgt aacagctttt aaagc 85

<210> 29
<211> 58
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-101

<400> 29
tcgacaattt cggtagctac aatccgagta ccggcgccac aaaattagge gaagtcac 58

<210> 30
<211> 53
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: xyTv-102

<400> 30
tagtgatgga tccgtatctg atatctaccg tacccaacgc gttatcagc cat 53

<210> 31
<211> 59
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TrX-103

<400> 31
cgatcattgg aaccgcccac ttttatcagt actggagtgc cagacgtaat catcggagc 59

<210> 32
<211> 69
<212> DNA
<213> Artificial Sequence

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<220>

<223> Description of Artificial Sequence: XyTV-104

<400> 32

tccgggtcgg ttaatactgc gaatcacctt aatgcacggg cacagcaagg gtaaacctta 60
 ggtacaatg 69

<210> 33

<211> 67

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-105

<400> 33

gattatcaaa tcgtacgggc ggaaggctac tcttcgagtc gttccgctag tttacagtg 60
 agctaaa 67

<210> 34

<211> 73

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-110

<400> 34

gtcaaagcca tggatgttag gtcacgggc gcggtgtttt aatccgcttc agtgatcact 60
 acctaggcat ata 73

<210> 35

<211> 54

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-109

<400> 35

ctatagatgg catgggtcgc gcaattagtc ggtagctagt aaccttggcg gtgg 54

<210> 36

<211> 60

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-108

<400> 36

aaaatagta tgacctcaca atctgcatta gtagctcga ggccaagcca attatgacgc 60

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<210> 37
 <211> 66
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: xyTv-107

<400> 37
 ttagtgaaat tacgtaccgc tgctgtccc aattgggac catgttacct aatagcttag 60
 catcgc 66

<210> 38
 <211> 53
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: xyTv-106

<400> 38
 caccctccga tgaagagctc accaaggcga tcataatgct accgatttc tag 53

<210> 39
 <211> 596
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: TrX

<400> 39
 cttagcraagg aggcctgcaga tgcacaacaat acaaccagga accgggtaca acaacggrra 60
 orctttacagc tattgggaacg atggccatgg tggctgtacc tatacaaacg ggcccggagg 120
 ccaattttagc gtcaatttggc ttaactccgg aaacttcgta ggtggaaaag gttggcaacc 180
 cgggaccaaa aataagggtga tcaacttctc tggatcttat aatccgaatg ggaattcata 240
 cttaagcgtc tatggctggc ctgaaaacc accgattgaa tattacattg tggaaaattt 300
 cgggtacctac aatccgagta ccggcgccac aaaattaggc gaagtcacta gtgatggatc 360
 cgtatargat atctaccgta cccaacgcgt taatcagcca tcatcattg gaaccgccac 420
 ctcttatcag tactggagtg ttagacgtaa tcatcggagc tccgggtcgg tcaatactgc 480
 gaarcacrrr aatgcattggg cacagcaagg gttaacccta ggtacaatgg attatcaaat 540
 cgtagcggctg gaaggctact tctcagatgg ttccgctagt attacagrra gctaaa 596

<210> 40
 <211> 36
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Tx-75a-1

<400> 40
 tgggaattca tacttagccg tctatggctg gtctag 36

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<210> 41
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-105H-1

<400> 41
accggcgcca caaaacacgg cgaagtcact agtgcaggat cc 42

<210> 42
<211> 44
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-C1

<400> 42
ccaaggcgat cataatgtca ctgcatttct agaacttoga accc 44

<210> 43
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-del(123-144)-1r

<400> 43
cggagctccg acgcgttggg tacggtagat atcata 36

<210> 44
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-105R-1

<400> 44
accggcgcca caaaaagagg cgaagtcact agtgcaggat cc 42

<210> 45
<211> 41
<212> DNA
<213> Artificial Sequence

<220> 41
<223> Description of Artificial Sequence: Tx-NI

<400> 45

21

TOTAL: 42805660

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ctagcttaagg aggcgcaca tgcacaacaat acacccagga a

41

<210> 46
 <211> 36
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Tx-75G-1

<400> 46
 tgggaattca tacctaggcg tctatggctg gcttag

36

<210> 47
 <211>
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Tx-144R-1r

<400> 47

<210> 48
 <211>
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: TX-161R-1r

<400> 48

<210> 49
 <211> 40
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: TX-125A-129E-1

<400> 49
 ccaacgcgtt aatgcgocat cgatcgaggg aaccgccacc

40

<210> 50
 <211>
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: TX-116G-1

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TOFTT-42806660

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<400> 50

<210> 51

<211>

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: TX-118C-1

<400> 52

<210> 52

<211>

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: TX-10H11D

<400> 52

<210> 53

<211>

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: TX-116G-118C-1

<400> 53

<210> 54

<211>

<212> DNA

<213> Aspergillus kawachii

<400> 54